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OF THE

AMERICAN ASSOCIATION

OF

CEREAL CHEMISTS

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Editor — J. R. Hess
Advertising Manager — R. S. Herman

Minutes of the Annual Meeting June 1, 2, 3, 1921

June 1. Meeting called to order at 10 a. m., Coates House, Kansas City, Mo., by Vice President Lawellin in absence of President Mitchell.

10 A. M.—Roll call responded to by the following:

S. J. Lawellin
C. J. Patterson
H. E. Weaver
M. E. Schulz
R. S. Herman
J. R. Hess
L. E. Leatherock
Ralph Potts
A. R. Sasse
J. C. Wood
R. K. Durham
R. J. Clark
L. Maher
H. F. Vaupel
A. A. Jones
G. S. Lyman
H. H. Johnson
G. L. Brendell
W. A. Goldtrap
W. L. Bergman
G. L. Alexander
H. J. Fleming
R. V. McVey
J. M. McCaddon
C. Ward

There were a number of visitors present. Letters read by Secretary Patterson from absent members. Resignation of R. A. Lusk read on account of entering a different field.

Report of committees heard.

Secretary-Treasurer's report showed a balance of $176.63 in Treasury.

Editor reported four Journals published since last meeting.

Business Manager reported on advertising solicited and contracted for.

Adjourned until 1 P. M.

1 P. M.—The following was the result of the election of officers for the ensuing year:

President—S. J. Lawellin, New Ulm, Minn.

Vice Pres. and Bus. Mgr.—R. S. Herman, Kansas City, Mo.

Secretary-Treasurer—A.A. Jones, Hutchinson, Kans.

Editor—J. R. Hess, Hutchinson, Kans.

Chairman of Executive Committee —M. E. Shulz, Salina, Kans.

President appointed on this committee three members as follows:

L. H. McLaren, Minneapolis, Minn.
L. E. Leatherock, Wichita, Kans.
A. R. Sasse, Kansas City, Kans.

Paper read by A. R. Sasse, "A Message from the A. A. C. C." This paper is to be read by Mr. Sasse at the Association of Operative Millers Convention in Buffalo, June 8th.

Motion that we have our annual banquet Thursday evening at the Coates House. Carried.

Motion that we attend the Orpheum theater in a body following the banquet. Carried.

Motion that ladies be invited to attend both banquet and theater. Carried.

Paper by J. R. Hess—"Uniform Flour." Discussion.

Motion by Hess that President appoint a committee of two to represent our Association on the "Committee of Allied Associations." Carried.

President appointed on this committee —H. E. Weaver and C. J. Patterson.

The editor made a special plea for cooperation. The following pledges for papers for the Journal for the coming year were obtained: Leatherock (1),

Wood (1), Herman (1), Jones (1), Shulz (4), Durham (2), Maher (1), Lawellin (1).

Adjourned.

June 2, 9 A. M.—Meeting called to order by President Lawellin

Paper by M. E. Shulz—"Water Softening as Applied to the Milling Industry."

This interesting paper was folowed by discussion and exhibit of zeolites recommended. One a synthetic product and the other a natural Dakota product.

Paper by R. S. Herman—"The Chemist and the Head Miller." Discussion.

1:30 P. M.

Adjourned for lunch.

Paper by J. C. Wood—"Mixed Feeds."

Paper by S. J. Lawellin—"Further Observation on the Use of Glacial Acetic Acid as a Method for Protein Determinations." This paper is a continuation of last year's paper by Mr. Lawellin and published in the Journal entitled "Proteins Extracted from Flour by Glacial Acetic Acid." Mr. Lawellin's work was very interesting and his conclusions were negative as a practical laboratory method. Discussion.

Mr. Weaver next gave an outline of the paper which he will read at the Operative Millers convention in Buffalo, June 9th.

Mr. Oaks, the Head Miller of the Kansas State Agricultural College Milling Department was present and talked on Experimental Milling.

Round table and general discussion of methods and other matters of interest.

Adjourned.

June 3rd, 9 A. M.

Business Meeting—Members Only

Reports of Committees.

The following method for water soluble constituent was recommended by the committee appointed last year, as a Tentative Method of the Association. Committee was composed of Lawellin, McLaren and Weaver.

Tentative Method for Water Soluble Constituents:

The solution is the same as the official Acidity Method adopted last year.

10 grams sample in 250cc. recently boiled distilled water.

Digest for two hours at 40 degrees C., shake every fifteen minutes, centrifuge and filter or filter with suction.

1. Pipette 25 C.C. Aliquot for acidity by official method, (N-100 NaOH suggested for titration).

2. Pipette 25 C.C. for water soluble solids.

3. Pipette 25 C.C. water soluble proteins.

4. Pipette 25 C.C. Sugar, by either Benedict Method, Fehlings Method, or Benedict Scales.

Motion by Hees to accept the method recommended by the committee as an A. A. C. C. Tentative Method.

Motion Carried.

Mr. C. V. Topping, Secretary of the Southwestern Millers League next addressed us.

Motion by Hess that a small charge of $1.00 per year or 25c per copy be made for the Journal to non-members.

Motion lost.

Motion by Shulz that the Association subscribe to any publications which the Editor needs.

Motion carried.

Discussion of doughs and fermentation followed.

Motion by Hess that in order to make uniform bread the following be adopted as a Tentative Method.

Tentative Method

Scale dough at 17½ oz. or 496 grams, on 60% absorption basis. This to give a standard one pound loaf of bread.

Motion carried.

To make this method practical it was necessary to adopt a standard pan.

Motion by Hess that we adopt as a Tentative Method a standard one pound loaf pan of the following dimensions:

Top inside 4⅛ X 8⅜ inches.
Bottom inside 3¾ X 8⅛ inches.
Depth inside 2½ inches.

Motion carried.

The following members appointed by President to draw up revised methods of analysis:—Jones, Rainey, Mann, Hess, Leatherock, Potts. A copy of these revised methods to be sent to all members with suggestions for revision.

Mr. Theodore Ismert, through Mr. Herman, expressed his deep appreciation of his being elected to Honorary Membership.

Annual Meeting adjourned.

President's Message

The Members of the A. A. C.C. Assembled in Kansas City this 1st day of June, 1921.

I wish to extend to you a hearty greeting even though circumstances have prevented me being with you as I most certainly would prefer. I take this means of speaking to you the few words I could better say were I present in person.

Friends, another year has passed and we are assembled here today to total the account of our endeavor and make plans for another year, one we hope will be even more fruitful of results than the one just passed. The few hours just ahead of us will indicate to us and the world the measure of success that our efforts have met with. Oftimes progress in scientific endeavor is slow, sometimes most discouraging slow, but then it is to be remembered that a live spirit and active thought make for progress even though startling developments do not accompany it. You who have assembled here represent spirit of progress and development and in this body the leaven of scientific thought will ultimately produce much of value to the industries represented.

Let me urge upon you one and all the benefit of free discussion and debate; it is good for our minds and profitable for all concerned. Conclusions reached in open forum such as ours where each member weighs all points without prejudice must of necessity have merit and carry with them confidence of their worth. You have spent time and effort as well as thought and study on the problems which we have to meet in the course of our duties as cereal chemists. Let us present our ideas and conclusions before this meeting and share one with the other, the fruit of our efforts to improve analytic methods.

A review of the work done this past year by the association is not necessary as the reports of your officers will accomplish that, but I would take this occasion to call to your attention the commendable results of the efforts of our untiring editor as well as those of Mr. Lawellan. They have each rendered a great service to our association and deserve your hearty thanks and wholehearted support. Our Journal has appeared at more frequent intervals and the articles submitted are a credit to the association. This is a fitting time for me to again urge upon you the need of your generous co-operation with the editor to the end that the Journal may become a most valuable organ to the fraternity of cereal chemists. You will go from this meeting filled with new enthusiasm for the work that is for us to do and it is my sincere hope that you will retain the same spirit throughout the coming year.

I feel sure that you will pardon me if at this time I offer a word of suggestion, inspired by my experience of the last few years. It is in regard to a phase of cereal chemistry that in the past has been neglected. I have in mind the practical problems involved in using flour in the bake shop. The baking industry is coming more and more to recognize the value of technical knowledge in making bread and it naturally devolves on the mill chemist to become acquainted with fermentation processes in order that he may better serve his employer. The mill chemist of the not distant future must be well versed in bread making if he is to be successful in meeting the problems that will present themselves.

Analytical data is of little value unless wisely interpreted and the ability to make true interpretations and applications involves sound technical knowledge of both the chemical laws and commercial practice. My suggestion is that you acquaint yourself with baking technique and the factors involved in bread-dough fermentation under commercial conditions. It is becoming more apparent every day that the milling chemists field is bounded not by "wheat received and flour shipped" but by "wheat harvested and bread sold."

These few thoughts I leave with you with a full knowledge that I am not alone in my views but privileged thru your courtesy to present them as the president of your organization. I thank you.

Signed R. Wallace Mitchell,
President.

A Message From the American Association of Cereal Chemists

By A. R. Sasse, Chemist for the Southwestern Milling Co., Inc., Kansas City, Mo., Member of the American Association of Cereal Chemists.

I have been asked to address you today as a member of the American Association of Cereal Chemists. I know that our Membership, and I thoroughly believe that you men, are coming to realize more fully every day the close relationship of the operative miller and the cereal chemist, and I have, therefore, chosen as the subject on which I would like to speak to you, the value of the flour laboratory to the milling business, and more particularly, the relationship between the operative miller and the flour chemist and the common interests of both.

Wheat flour milling is one of the oldest industries of civilization and yet it has been one of the last to employ chemistry in an attempt to improve and better its process of manufacture. Science has made wonderful progress in the last few decades and each day we become more familiar with the wonders it has wrought. Every industry that is operating successfully today is operating in accordance with the most modern methods applicable to the particular industry. These modern methods of manufacture, in many cases, are entirely different from those used in the days of our forefathers, because the industry has taken cognizance not only of the great advances that have been made in the mechanical arts but also the discoveries made through chemistry, resulting in a better understanding of the substances handled and the consequent improvement in the methods of manufacture.

Such radical changes in the methods of manufacture as have taken place in a great many of our manufacturing industries during the past thirty to fifty years are not evident in the milling industry and our method of milling today has not changed very much from what it was fifty, one-hundred, or two-hundred years ago. Of course, there are some changes being made all the time because you will always find some enterprising miller who is not altogether satisfied with following in every detail the trade as he may have learned it, and he sets to work to try to improve on the old process, but the changes that have been made are more in the nature of improvements and not radical as to method. Any of you who are familiar with a mill can visualize a mill of the past, I don't care how early in the history of man the date may be, if he is given only a few salient, descriptive points, but who of us can visualize a mill of the future if the process of milling were to undergo such radical changes through the aid of chemistry as have taken place in a great many of our manufacturing industries in the last five decades. I cannot picture such a mill to you because I do not know any more what it would be like than you, but my faith in the application of chemistry and my imagination are such that I believe some day there will be a radical change in the method and process of milling wheat and when that time comes, I venture to say that none of you will be able to state, "Yes, that is just about the same way my father and grandfather used to do it."

But to return to the more practical part of what I want to say. Let us consider for a minute how the modern milling business of today is organized in order to meet competition and what part the laboratory takes in such an organization. The organization of a milling business of any size is today divided into three distinct departments: The first covers the purchase of the raw material; The second covers the actual manufacture of the milling products and the third covers the sale of the products. Each department is distinct from the other and each in itself must be efficient because no matter how good or how efficient any two of the different departments are, if any one of the three departments is not efficient and fails in the work which it has to do, the business as a whole cannot meet competition and survive.

A laboratory, properly operated can be of invaluable assistance to each one of these departments. Let us take, first the buying of the raw material, wheat. The flour-buying trade of today, both domestic and foreign is increasingly becoming more particular and more specific in stating the terms upon which they wish to buy flour, and as a result, a mill must be more particular in making its contracts and filling them and must be sure that it can deliver just what it sells, and the only way that it can be sure that it can make flour to fill certain technical specifications as ash, protein content, etc., is to first make sure that it has the proper kind and grade of wheat from which such flour can be milled.

The larger mills of today no longer purchase their wheat from the immediate territory in which they are located but draw wheat from the various wheat raising sections of the entire country, and in some cases, import wheat, and the only way that a wheat buyer caa assure himself that the variouos grades and kinds of wheat for which he contracts will assure him of a mixture which the mill should grind, is to test the wheat by sample in the laboratory.

When it comes to the actual grinding of this wheat there should be no guess work as to what the mill mixture is. To let the elevator make up the mill mixture, send it to the mill and have the mill grind for a number of hours on that mixture and then find the flour is wrong by testing it in the Laboratory or otherwise, means that the Laboratory is not functioning properly, either through lack of co-operation between the wheat department and the laboratory, or through lack of efficiency in the laboratory itself. A laboratory should determine just what kind of flour any particular mixture, which the elevator makes up to go to the mill, will make before the mill begins to grind it.

It, therefore, must be plain to all that such work on the part of the laboratory cannot help but increase and maintain the standard of efficiency of the wheat-buying and elevator departments of the business and that the wheat buyer and laboratory should work very close together.

After the laboratory has served the wheat end of the business, as stated above, it should work with the miller to see that the best results are obtained from the wheat mixture. Every miller knows that one of the most important things in the process of his milling is the tempering or conditioning of his wheat. For several hundreds of years past and up to comparatively very recently, the only object which a miller had in tempering his wheat was in order to get a better dressed flour. He also knew that the tempering had an influence upon the color of his flour but he did not know that the baking quality of his flour might be considerably affected by the tempering or conditioning of his wheat and that this effect of tempering is more pronounced with some kinds of wheat than others and more important in milling new wheat than old wheat. Today a miller should temper and condition his wheat, based upon information gained from the laboratory as to just what method and length of temper will give him not only the best dress and color on his flour, but also insure the best baking qualities of the flour.

A laboratory should work with the miller in testing the different kinds of stock in the milling process and if a mill is making different grades of flour, determine by analysis of the different stocks into which grade some of the streams, which are rather difficult to grade by simply putting them under the slick, should go. It might be, of two such streams, that one is going into a good grade of flour and one into a poorer grade, when, as a matter of fact, they would be better reversed because of the ash or baking qualities, although to look at them they might appear to be the same.

A laboratory should work with the miller in maintaining uniform quality of the flour by taking frequent samples and making the necessary tests. I wish to state right here, however, that these tests on the finished flour to ascertain as to whether or not it is up to standard, while they should be made and are of much assistance in maintaining a uniform standard, are not, as some people think, the all important part of laboratory work. Relatively, it amounts to little, because the real work of the laboratory should all have been done before the flour is made, and if it is properly done a miller should have very little or no trouble in milling the wheat and maintaining the standard of his flour. Thus the laboratory, by working with the miller, insures the greatest efficiency in the actual operation of the mill and can be of great assistance to the miller in helping him maintain the uniformity of his product.

I come now to the relationship of the laboratory to the third division of the milling business, that is, the selling. In both the buying and mixing of the wheat, and in the actual grinding thereof, the relation of the laboratory to each department is close and direct. When it comes to the selling, the work and value of the laboratory is more indirect, nevertheless, it is important. One of the rudiments of good salesmanship is confidence in what one has to sell, and even if a salesman has such confidence, his lot in the flour business it is not an easy one unless the purchaser has confidence in the concern which the salesman represents and nothing will better establish confidence in both the salesman and purchaser than the fact that the mill has an efficient laboratory, a laboratory to which competitors' samples can be submitted for test and analysis, a laboratory capable of giving out reasonable and correct information of value to bakers, both large and small, and

a laboratory to which a salesman of the organization can come and gain knowledge valuable to him as a salesman, and inspiration through actually seeing and realizing the work which the laboratory does and to what extent he can depend upon the organization back of him to deliver what he sells.

In the foregoing I have tried to portray to you the place that the laboratory should hold in the milling organization in reference to the three divisions of the business and this work is the practical, everyday, all important work which the laboratory must do, but, in addition to this, there is much other work of importance for the laboratory. Feed analysis must be made in order that the mills' feed may be registered in many different States. Samples of flour sent in from outside must be tested in order to find out how they can be matched, and right here, let me state that the importance of the laboratory in giving information to the sales department and the miller in regard to matching samples of flour which the trade wish to buy, cannot be over-estimated. With the determination of ash, protein, color, etc., and the knowledge of wheats available which will make flours with given constitutents, the laboratory should be able to give the miller and the management such information as to permit them to properly match samples of flour at a minimum cost, without which knowledge they could not figure intelligently.

The laboratory must also be able to give information, based upon the study of bacteriology, and so help the problem of spoilage. This is particularly true as regards feed. Last year a great many mills from all sections of the country had a lot of feed spoil in transit and no one seemed to know why. The spoilage was not due entirely to too high moisture content nor the packing of the feed in too small a bag, because a reduction of moisture content and increase in size of bag did not seem to overcome the difficulty, and the laboratories of the mills were called upon to find some way to prevent this spoilage.

The laboratories are also called upon to help the miller in the extermination of the moths and weevils which can be found in every mill.

Some of you will doubtless ask why, in view of these statements, if the work of the laboratory is of so much value and so important to the organization of a milling company, do we often hear so much belittling its work and importance. I will tell you why. The importance of a mill laboratory of today is belittled because of either one of two reasons—or perhaps both. Either some part of the mill organization outside of the laboratory is too old-fashioned or too ignorant and prejudiced to appreciate and avail itself of the assistance which the laboratory can give to each department, or the man in charge of the laboratory is too theorotical, not practical, and is not capable of managing the laboratory and co-operating with the other departments of the milling business.

In a successful mill organization the management has confidence in the wheat buyer, the miller, the laboratory and the salesmen, and each of these, in turn, has not only confidence in the other but the ability to co-operate with the other. The miller who will not take his troubles to the laboratory in order that the laboratory may help him solve them is not cooperating with the laboratory and the laboratory which does not ask for the cooperation, advice and assistance of any department of the mill's organization in the development and working out of any ideas or problems which it may have is not carrying on its work as it should and will not get the proper results. To every cereal chemist in charge of a laboratory who thinks or feels that the laboratory is not given due recognition and importanct, I wish to say—Make sure the fault is not yours. Don't try to inject too much theory into the practical end of the business. Show your willingness to help rather than direct the different milling departmens, and make everyone feel that you want to work with them to make their department more efficient.

Therefore, after all has been said in regard to the laboratory, its value, its functions, etc., the one thought which I would like to impress upon all you who hear me and have you carry away and remember, is Co-Operation. CO-OPERATION. Don't forget it, think what it means, practice it. Help every other part of the organization to practice it, and believe me, if you have not done so and will do so, your eyes will be opened to the value, importance and help of good milling laboratory.

Further Observations On the Use of Glacial Acetic Acid in Gluten Determinations

By S. J. Lawellin

The experiments reported in a paper before the American Association of Cereal Chemists in convention at Kansas City last year have been continued to some extent. These experiments have been conducted to further test the assumption of Marchadier and Goujon that gluten in flour could be determined by the use of strong acids and alkalies. In their work glacial acetic acid was used and so this reagent was employed in all determinations reported in this paper as also the previous one.

In the former paper the results obtained by acetic acid extraction were, in the main, so close to the percentage of gliadin as obtained from the flour by solution in 70 per cent alcohol, that it was thought possibly gliadin alone could be extracted by glacial acetic acid. Two general assumptions were made in our previous paper and these have been made the subject of this study. These assumptions were, namely; (1) that a certain definite percentage of flour is soluble in glacial acetic acid, and; (2) that a certain protein or class of proteins are isolated by this reagent. It was stated at that time that further experiments would be conducted, along this line, looking to the proving or disproving of these two assumptions.

It was intended to repeat the original procedure until sufficient proof had been secured to warrant the acceptance or rejection of this first assumption. Also, it was believed that a separation of the proteins extracted from flour by glacial acetic acid, or the hydrolysis of these proteins with subsequent tests of the organic acids thus formed would tend to prove or disprove the second assumption. Much of this work has not been accomplished due to the lack of assistance and time, but the few experiments carried out throw some light on the assumptions made and also further data on the use of glacial acetic acid in flour analyses.

The extractions as made by glacial acetic acid were the same as recommended last year as method No. 1 and is as follows: Into a centrifugal tube place one gram sample of flour to be tested. To each tube 10cc of glacial acetic acid are added. By means of a glass stirring rod the sample is thoroughly stirred being careful to break up all lumps and get a homogenous mixture. The sample is allowed to stand ten minutes when it is again stirred, and, after removing stirring rods, centrifuge for five minutes. The clear solution is then decanted into a tared crystallizing dish, another 10cc portion of acid added and the operation repeated. After the second centrifuging the second portion is decanted into the dish with the first. In decanting great care must be used to prevent part of sample being carried along. In this work decantation was made drop by drop and stirring rod used to prevent creeping and spattering. Crystallizing dish is now placed on hot plate which is kept just hot enough to cause acid solution to simmer gently. Sample is watched closely near end of evaporation and removed just before disappearance of liquid. Dish is now placed in drying oven at 104 degrees Centigrade and dried for one hour. Place in dessicator, allow to cool, and weigh. Weight of residue in milligrams is percentage direct.

A thin slab of asbestos placed on hot plate will assist in preventing scorching and excessive heating and creeping of sample.

Experiments were conducted on four flours of the same grades as previously used. These four flours from a different crop however and this would cause some variaton. Consequently there can be no comparison between the same grades of the different years except as relating to actual complete analysis as given. Changes in milling processes and in the wheats of the two crops would not only cause differences in analyses but also in proportions of various constitutents. These variations would not apply however in the second premises which relates only to protein or proteins contained as shown by complete analysis. These differences would undoubtedly have a marked effect on the first premise and this is borne out by the familiar test for water soluble solids. Samples were approximately a month old and made at nearly the same time. Samples were thoroughly air dried and so chosen to prevent undue changes due to change of moisture content or any of the variations likely to be encountered in ageing. Sample No. 1 was a special patent wheaten flour; sample No. 2 a bakers' straight or patent wheaten flour; sample No. 3 a

first wheaten clear, and sample No. 4 a patent rye or pure white rye flour. Complete analyses were made on each of these flours and the results calculated to a moisture free basis. These analyses are given in Table No. 1.

TABLE NO. 1

Sample	No. 1	No. 2	No. 3	No. 4
Moisture	None	None	None	None
Ash	0.473	0.525	0.830	0.557
Nitrogen	2.18	2.31	2.42	1.55
Protein Nx5.7	12.40	13.16	13.82	8.85*
Gluten Nx6.25	13.62	14.43	15.15	9.70†
Acidity	0.085	0.095	0.131	0.131
Dextrose	14.10	14.62	17.61	11.40
Water Sol. Solids	7.57	7.77	8.63	9.99
Water Sol. Protein	1.92	2.02	2.13	3.39
Gliadin	6.72	7.50	7.08	4.58
Glutenin	3.72	3.58	4.20	1.55
Salt Sol. Proteins 5% K2SO4 Soln.	1.975	2.07	2.53	2.70
Salt Sol. Proteins 1% NaCl Soln.	2.48	2.91	3.51	3.96

*Generally calculated by factor 5.61
†Calculated for comparison only.

In Table No. 2 are given the calculated theoretical proteins as calculated from analyses made on flours used.

TABLE NO. 2

Sample	No. 1	No. 2	No. 3	No. 4
Total Protein	12.40	13.16	13.82	8.85
Non-Gluten Protein	1.96	2.08	2.54	2.72
True Glutens	10.44	11.08	11.28	6.13
Gliadin	6.72	7.50	7.08	4.58
Glutenin	3.72	3.58	4.20	1.55
Edistin & Leucosin	1.65	1.75	1.86	3.12
Amido Proteins	0.31	0.33	0.68	0.40

Many extraction were made, and discarded, by the use of acetic acid. Any experiment or extraction where there was any doubt as to the reliability or accuracy of manipulation was discarded regardless of results. Some of these checked closely to those given but it was patent that operations had not been up to standard. Arrangement for data for bearing on premise No. 1 is set forth in Table No. 3, as follows:

TABLE NO. 3

Extr't'n No.	Flour No. 1	Flour No. 2	Flour No. 3	Flour No. 4
1	11.18%	11.97%	12.63%	8.90%
2	11.05	11.26	11.45	6.89
3	10.15	10.38	11.10	7.78
4	10.88	11.10	12.02	7.87
5	10.54	10.50	11.28	8.32
6	10.95	11.02	12.08	8.07
7	10.78	11.80	12.37	7.93
8	10.86	11.22	11.94	8.02
9	10.12	10.25	11.15	7.66
10	10.60	11.12	12.28	8.04
Average	10.711	11.062	11.840	7.948
Maximum Diff.	1.060	1.720	1.530	2.010

An examination and comparison of Table No. 3 clearly shows that the variation is too great to consider the premise any longer. Any determination with a liable error of 1.060% in results, or an actual percentage error of approximately 10%, cannot be of any use in the cereal laboratory. If a certain definite proportion of flour was soluble in glacial acetic acid it would surely show closer checks than have been obtained. Sufficient determinations have been made and enough care exercised to closely demonstrate this point. Also a few experiments have been made with larger amounts of acid and longer extraction periods but have proven to be of no more value than those reported. Therefore, we are quite convinced that there is no definite proportion of flour or flours that is soluble in glacial acetic acid and that any determination, on flour, of solid soluble in acetic acid is of absolutely no value. There also seems to be no relation between the water soluble solids and the acetic acid soluble solids and the latter could hardly be substituted for the former.

For the work on proteins the extracted residues as reported in Table No. 3 were used. These were divided in pairs and one pair run for each of the following determinations: proteins soluble in 70% alcohol, proteins soluble in 5% K2SO4 solution, proteins soluble in 1% NaCl solution, proteins soluble in pure distilled water and total proteins.

The proteins soluble in 70% alcohol, 5% K2SO4 solution, and 1% NaCl solution were determind by treating the residues extracted by acetic acid with the respective solutions and digesting for sixteen hours in each case. Solutions were then decanted, centrifuged and filtered and solutions made to mark in graduated flask. 100 cc. of solvent was used in each case. Duplicate aliquots were taken of each of these and, after removing solvent by evaporation, the nitrogen determined by the Kjeldahl-Gunning method using anhydrous sodium sulphate in place of the potassium salt.

With the proteins soluble in pure distilled water two extraction periods were

employed in preliminary work and a sixteen hour extraction employed. The other period tried was a four hour period which gave slightly lower results and is not reported. After sixteen hours digestion the pure water solution was treated in same manner as for other proteins previously named.

For total proteins the extracted residues were treated in crystallizing dish with 20 cc. sulphuric acid, Sp. G. 1.84, and allowed to stand over-night. Residue was loosened by means of a glass scraper and entire residue washed into a Kjeldahl flask with 1:1 sulphuric acid using as little wash solution as possible. Anhydrous sodium sulphate was now added and nitrogen determined by the Kjeldahl -Gunning method.

Arrangements of data bearing on premise No. 2 and obtained by separation of proteins is given in Table No. 4 as follows:

TABLE NO. 4

Protein		No. 1 Flour	No. 2 Flour	No. 3 Flour	No. 4 Flour
As Gliadin	(1)	1.015	1.455	0.922	0.918
As Gliadin	(2)	1.072	1.400	0.865	0.862
As Wate Soluble Protein	(1)	0.338	0.336	0.173	0.344
" "	(2)	0.395	0.392	0.288	0.460
As Salt Soluble Protein 5% K2SO4	(1)	0.338	0.672	0.805	0.574
" "	(2)	0.361	0.728	0.922	0.551
As Protein	(1)	7.450	7.620	8.070	5.400
" "	(2)	7.480	7.750	8.180	5.400
As Gluten	(1)	8.160	8.350	8.820	5.920
" "	(2)	8.200	8.500	8.950	5.920
As Salt Soluble Protein 1% NaCl	(1)	0.508	0.448	0.633	0.460
" "	(2)	0.565	0.450	0.748	0.517

Comparison of this table with complete analyses of the flour and the theoretical calculated proteins show very plainly that no definite protein or class of proteins are separated from flour by glacial acetic acid. In the separation of the proteins, portions were secured that definitely represented the true glutens, gliadin and glutenin; the globulins, edistin and leucosin; and the nitrogenous bases and amino acids.

In no case was it possible to account for all of the proteins separated by acetic acid as shown by the determination of total proteins by the Kjeldahl-Gunning method. Possibly this difference between the total soluble proteins of the acid extracts and the total proteins could be glutenin, a supposedly rather insoluble protein. But the determination as a means of determining glutenin could be of no value where corrections would have to be made for all of the soluble proteins.

In all of the protein determinations a blank was run with each set and the corrections made as shown. C. P. sugar was used in all blank determinations. N-10 acid and alkali were used with special direct reading burettes.

In many of the determinations for soluble proteins the percentages were so low as to hardly be called more than traces but the combined results would have material significance in final results if total proteins of extratc were to be taken as either gliadin or glutenin. Perhaps further study of the proteins, extracted by acetic acid, by hydrolysis and subsequent separation of the acids formed might give something of interest but from the work done it would hardly show up to be of any value in the routine work of a cereal laboratory.

The original publication of Marchadier and Goujon has not as yet been secured but attempts have been made to obtain this and learn more of the theory and procedure that caused them to arrive at the conclusion that the gluten in flour could be determined by glacial acetic acid and that this method could easily replace the washing and drying of gluten. Even after standardizing all operations the method remains a crude one and is very tedious and disagreeable. As bearing on the two premises made in our previous paper the work done since then has shown them to be of no value and they cannot be adhered to longer. Neither can the assumption of Marchadied and Goujon, as relating to acetic acid, be taken seriously unless they followed a much different procedure than that indicated in the note that came to our attention.

Summing up the entire work done on this theory we would say that glacial acetic acid as a reagent in the determination of gluten, or any definite protein or class of proteins, in flour, is of no use whatever. Our conclusions are that no definite amount of solids, proteins, or class of proteins is soluble in glacial acetic acid. In fact the process appears to be not only inaccurate but is decidedly tedious and disagreeable. Its use cannot be recommended.

Variation in Moisture Content of Flour During Storage

By R. S. Herman and Walter Hall.

The moisture content of flour has been receiving more attention of late years in both contract specifications and government regulations. There is no question but what the moisture content is an important factor in considering the value of flour as to keeping qualities under the average conditions of storage. It is adviseable for the Miller, when accepting contracts in which the moisture content is specified as to maximum limits, to consider the average climatic conditions at point of destination and if necessary to make allowances for same.

The moisture content of flour is continually changing during storage and transit due to variations in climatic conditions. These fluctuations vary in severeness of course, depending upon the season of the year and the locality. In this relation relative humidity has the greatest influence. It should be remembered that water vapor is always present in the air due to the constant evaporation taking place, and the percentage present is dependent upon the temperature, as warm air will hold more vapour than cold air. Flour stored under conditions of high relative humidity will absorb moisture from the air, while a low relative humidity (the temperature remaining constant) will cause evaporation. Flour milled in the Southwest will usually lose at least one half of one percent of moisture during the first week, but on long hauls to eastern or southern points there is quite often a gain.

The results given in the following table were obtained over a period of one month from the date of milling on the same sample of flour. The flour was stored in a cotton sack, thoroughly exposed to the air. Observations as to temperature and relative humidity were made at time sample was taken for analyses. It is believed that the results indicated would approach average conditions in the immediate vicinity of Kansas City.

Date	Moisture	Temp.	Rel. Hum.
4-5-21	13.03	76	40
4-6	13.04	75	50
4-7	13.13	76	33
4-8	12.60	79	33
4-9	12.44	72	20
4-11	12.16	78	24
4-12	11.95	80	29
4-13	12.22	76	37
4-14	11.40	79	39
4-15	11.71	84	38
4-16	12.13	72	26
4-18	11.83	77	26
4-19	10.66	78	28
4-20	10.69	72	37
4-21	10.68	80	33
4-22	10.45	70	37
4-23	10.18	74	36
4-25	10.20	75	32
4-26	10.68	77	29
4-27	10.92	74	33
4-28	10.11	76	31
4-29	10.42	70	37
4-30	10.57	71	32
5-2	10.90	74	30
5-3	10.97	76	33
5-4	10.26	79	29
5-5	10.53	77	33
5-6	10.51	76	35
5-7	10.57	71	41
5-9	10.89	73	52

Colloid Chemistry and the Cereal Chemist

By G. S. Lyman

I am prompted to write this short note, not because I feel competent to write, or even discuss, Colloidal Chemistry, from the standpoint of one who knows his subject, nor because of having worked out any particular point in the realm of Colloids, but because we as Cereal Chemists, almost daily, come in contact with problems, which bring us up to the "Enchanted and Mysterious" portals, beyond which lies the realm of Colloid Chemistry. I say "Enchanted and Mysterious." You know what I mean. Should we not be curious enough to want to break this spell of enchantment and mystery, so that when dealing with the Colloid phase of our our work, we can do so with a clear mind and conscience, if such is possible for a Cereal Chemist to do?

Everyone here who has watched bread in the dough or in the oven, (which means all of us) and who, while they were doing so, thought about the action taking place, it is most likely that most of us were, at the time, thinking Chemically, or "Enzymically," when we should be thinking, just a little, Colloidally.

What is bread, anyway? Is it a product that can be made up by merely mixing up the proper ingredients, of known chemical content, allowing the mixture to stand for a certain length of time, punching down at certain intervals, panning and baking till done, all under controlled conditions of temperature and humidity, of course, or is it a product, described by Dr. Wolfgang Ostwald, in his Theoretical and Applied Colloid Chemistry, (Translated by Dr. Martin H. Fischer)' as being the result of the formation of a starch and protein gel, possessing a definite structure? Or is it both? Of what does the structure of bread consist? What bearing has the chemical composition of the ingredients on this structure?

If I may take you back to the days of "Mother Goose," we are spending at least some of the time on the materials of "The House That Jack Built." Perhaps "Jack" could have built a better constructed house with the same materials.

Why does there seem to be such a void between the Cereal Chemist and the Baker? Could we be of any service to the Baker if we knew more about the nature of the Colloid structure of bread? Does it overtax your imagination to conceive that if it were possible for us to recognize the nature of the colloid structure of bread, we might, by merely having a loaf of bread from a dissatisfied Baker, for technical observation, be able to tell the Baker easily and clearly wherein he has erred. We as Cereal Chemists agree that it is always the Baker that errs.

My purpose and interest in this matter is to "Start Something." Create an interest, if possible, in the Colloid phase of our work. These few questions, just mentioned and many more, perhaps more interesting ones, could be answered by those who seek practical application of the facts regarding Matter in the Colloid State.

How are we going to be "In the Know" on the subject of Colloids? Very few of us have had the opportunity of studying it at College, and there seems to be very little written, that deals at any length, in a practical way, on cereals or cereal products. Probably it would not be a bad suggestion to take advantage of the help that the American Chemical Society now offers. A Colloid Development Committee has been formed, and may be called on for help. A list of publications, both old and new, on Colloid Chemistry, is printed on page 357 of the April Journal of Industrial and Engineering Chemistry.

I am hoping that someone will suggest a plan that will make it possible for any Cereal Chemist to obtain sufficient knowledge of the subject, that he can, in the future, at least recognize the Colloidal nature and action of substances with which he deals, thereby adding to his accomplishments as well as helping to make up for his deficiencies as a Chemist.

Technology of Bread Making, Fourth Edition

(Read before the Operative Millers Convention at Buffalo, New York.)

The many who have attempted to obtain copies of the third edition of "The Technology of Bread-Making, Chemistry and Analysis of Materials used in Bread-Making and Confectionery," by William Jago, only to find that it was exhausted some time ago, will be glad to know that the fourth edition has just been issued. This is not a new edition of the work, whose development has been sadly interferred with by the intervention of war conditions, but, as the preface states, "a slightly abridged reprint of the previous edition, with certain corrections and additions rendered necessary by advances in knowledge during the past few years. This has been rendered possible by the action of the Bakers' Helper Company, which has thrown itself into the breach at a time when the publication of a technical work is fraught with great difficulties and considerable risk." All concerned with technical study in the baking and milling trades will be interested to learn that copies of the work are once more availible, though the demand is not confined to this class of bakers. James Meilke, of Glascow, when he learned of the proposed edition a few months ago, said: "The edition now in my hands is in almost constant use, as there seem always to be something cropping up with which it deals, and no baker can afford to be without such a work, if he pretends to know anything of the trade."

The arrangement of the work is practically the same as the previous edition, beginning with general information in elementary chemistry, from which it proceeds to detailed discussion of that part of chemistry which has to do with the constitutents of the wheat grain and its carbohydrate, protein, fatty and ash constituents. Enzymes and diastatic action, the subject of fermentation generally and bacterial and putrefactive fermentations, are next treated, concluding with a chapter on the manufacture of yeasts. The physical structure and physiology of the wheat grain then receive attention, with chapters on the chemical composition of wheat, strength of flour and composition and properties of flour and other milling products.

The longest chapter in the book is that devoted to the title subject, bread-making, which is gone into in elaborate detail, and followed by chapters of highly practical information on bakehouse design and machine bakery.

The abridgement of the book, involving the excision of some three hundred pages of the text of the third edition, consists in the omission of matter of a more or less general nature, which though it has a perfectly proper connection with a work of this character is not essential to the purposes of the present edition. The physical appearance of the work, which is less than half the size of its predecessor, makes the difference more apparent than the reality justifies. The thin, highly finished paper has reduced the bulk considerably, an advantage which those who have occasion to handle books of this kind frequently will be quick to appreciate.—The Technology of Bread-Making, by William Jago and William C. Jago, American edition, Bakers' Helper Co., 327 South La Salle St., Chicago, Ill. 615 pages and index, 14 pages.—Bakers' Helper, Chicago, June 15, 1921.

Abstracts

Taken From the Experiment Station Record, Washington, D. C.

Experiments on the toxic action of certain gases on insects, seeds, and fungi, I. E. Neifert and G. L. Garrison (U. S. Dept. Agr. Bul. 893 (1920), pp. 16).—This is a report of experiments conducted with certain toxic gases to determine their value for fumigating purposes. The experiments were planned by a committee of four, and are the outcome of experiments on the action of toxic gases on the body louse, conducted in cooperation with the War Department. In the course of the work nearly 800 fumigations were made, in which 20,000 insects of about 15 different species were used. The data, which are presented in a tabular form, have led to the following conclusions:

"Phosgene is not useful as an inseciticide, because of its toxicity toward human beings, its high vapor pressure, the difficulty in controlling it, and its comparatively low toxicity toward insects. Neither does it possess any value as a fungicide. Arsene has no advantage other than ease of generation, and possesses many disadvantages as an inseciticide. Its toxicity toward insects is comparatively low, it is injurious to plants, and has no effect on fungi. Illuminating gas in concentrations up to 3 per cent and for exposures up to two hours is not toxic to insects. Carbon monoxid in concentrations up to 3 per cent and for exposures of two hours is not toxic to insects.

"Of the gases tested, cyanogen chlorid and chloropicrin give promise of being useful for fumigation purposes. Neither of these, however, can be used in greenhouse fumigation because of their injurious action on plants. Nevertheless they probably can be used in the fumigation of stored products. The efficiency of chloropicrin as an insecticide is undoubted. In general, it is more poisonous to stored-product insects than hydrocyanic acid. Other advantages which it possesses are ease of handling and control, low toxicity toward human beings, ease of detection, noninflammability. Its disadvantages are its adherent quality, which make it necessary to air the material for some time after it has been fumigated, its corrosive actions on metals, its severe lachrymal effect, and its low volatility. The last objection may be partially overcome by pouring the dose required on paper, thereby increasing the evaporating surface.

"As an insecticide, the effect of cyanogen chlorid is practically the same as that of hydrocyanic acid. Its disadvantages are its injurious effect on plant life, low boiling point, slightly corrosive action on metals, and severe lachrymosal effect. Its advantages are that it is active as a fumigant, is easily detected, is not injurious to seeds in doses which are toxic to insects and fungi, and is no more toxic toward human beings than hydrocyanic acid. It is safer to use than hydrocyanic acid because it can be detected in lower concentrations."

Properties affecting strength in wheaten flour, J. F. Martin (Jour. Soc. Chem. Indus., 39 (1920), No. 14, pp. 246T-251T).—This is a report of a study of the relation between various properties of flour and its "strength," this being defined as "the capacity of a flour to product a large and well-piled loaf." Factors previously suggested by other investigators as determining the strength of flour were studied, including total amount of gluten, the gliadin-gluten ratio, the amount of gas obtained during fermentation, and the concentration of electrolytes, especially phosphates. Observations were also made of the gas retaing capacity of the dough, the water-soluble proteins, the baking marks. The flours examined were straight grade flours from single wheat, differing widely in baking properties and in origin. The conclusions drawn from the reported results are as follows:

"No correlation appears to exist between strength and the amounts of total soluble extract, soluble phosphorus, or acidity.

"A strong flour must possess a minimum gas-producing capacity as measured by the amount of gas produced by fermentation during 24 hours. A deficiency in this respect can be rectified by the addition of an amylolytic enzym, e. g., a diastatic preparation. A strong flour possesses a high gas-retaining capacity. This has been shown to be due to the amount and form of proteins in the flour.

"The water-soluble protein increases with the length of the period of extraction, probably due to the proteolytic enzym action, at the expense of the alcohol-soluble protein. In estimating the gliadin present in flour it is necessary to make allowance for the water-soluble proteins, which are soluble to a great extent in dilute alcohol. Flours with high

gas-retaining capacities and high bakers' marks have been shown to be those in which the 'amended gliadin' figure is also high.

"For flours having a satisfactory gas-producting 'capacity, bakers' marks, gas-retaining capacity, and 'ameneded gliadin' content are closely related, and it is considered that the estimation of either of the latter together with the determination of the gas-producing capacity will indicate the 'strength' of the flour."

The heat of hydration and specific heat of wheat flour, F. Daniels, B. H. Kepner, and P. P. Murdick (Jour. Indus. and Engin. Chem., 12 (1920), No. 8, pp. 760-763).—This paper consists of a study of the relationship of the temperature of the flour and water to the resultant dough in bread making and a comparison of this relationship with the empirical formulas in general use in the baking industry.

The heat of hydration of various wheat flours was found to range from 7.6 B. t. u. per pound in a low grade to 5.4 B. t. u. per pound in winter wheat flour, with an average value of 6.5 B. t. u. per pound for a straight flour such as is used in bakeries. The heat of hydration decreased on exposure to the atmosphere, but did not change appreciably on aging when completely isolated from the air. The average specific heat of flour was found to be 0.34 on a moisture-free basis.

For the calculation of dough temperatures it is thought necessary to consider both the specific heat and heat of hydration. Formulas are given for this calculation under different conditions. For ideal conditions in which the room temperature is close to 80 degrees F. and the heat generated by mechanical means is neglible, the required temperature of the water can be calculated by the formula Tw equals 125—0.7 Tf where Tw and Tf are the temperatures of the water and flour, respectively. It is pointed out that for practical use in bakeries the formula must be modified with the help of data taken under actual working conditions.

The significance of defecation in connection with the absorption of the nitrogen of bread made with unbolted flour, E. C. Van Leersum (Extract from Arch. Neerland. Physiol. Homme et Anim., Ser. 3C, 3 (1919), No. 2 p. 199).—This work, like earlier experiments by the author, was undertaken to test the proportion of the total nitrogen of the wheat that is utilized by the body when coarse whole wheat bread is consumed in large quantities.

According to the author's previous work, the percentage of nitrogen absorbed varies with the dryness of the feces and becomes greater as the length of time before defecation is increased. In the present exeperiments, normal subjects were placed upon a diet containing a proportion of bran corresponding to that used in experiments reported by Hindhede. After a preliminary control period a condition of defecation similar to that usual with the subject of Hindhede's experiments was artifically induced by the administration of small doses of opium, and the same diet was continued through three more experimental periods. The stools for the different periods were compared and the nitrogen absorption for each was calculated, the results showing a noticeable increase in nitrogen absorption during the periods when the opium produced conditions of retarded digestion resembling those in the Danish experiments.

A careful study was also made of the nitrogen occuring in different parts of the grain and the comparative availability of that in the endosperm, the germ, the aleurone layer, and the outer coatings. From this it is concluded that the increase in nitrogen absorption which accompanied the retention of the feces was due more to the nitrogen from the endosperm than to the less available nitrogen from the outer portions of the grain, and this is considered further argument against the economy of bran as a source of nitrogen to the human body. In general, the author's experiments are held to indicate that for persons of normal habits of defecation—that is, for the great majority of persons—the consumption of unbolted flour entails a greater loss of nitrogen.

Wheat and the flour mill.—A handbook for practical flour millers, E. Bradfield (Liverpool: North. Pub. Co., Ltd., 1920, pp. (4)-|-XI-|- 163, pl. 1, fig. 1). —This volume consists of a foreword, by R. C. Winter; a collection of papers by the author on the theory and practice of modern flour milling; papers on the bleaching of flour, from a chemist's point of view, by W. Jago, and from a baker's point of view, by J. Kirkland; and a paper on chemistry and physics as applied to milling, by F. E. Treharne.

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